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**The Use of Clinical Guidelines
in the Management of
Magnetic Resonance Imaging
Services in Canada**

March 1994

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**THE USE OF CLINICAL GUIDELINES IN
THE MANAGEMENT OF
MAGNETIC RESONANCE IMAGING
SERVICES IN CANADA**

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SUMMARY

A survey was undertaken of all publicly funded Canadian MRI facilities to determine to what extent clinical guidelines are used in the management of Magnetic Resonance Imaging (MRI) services in Canada and to compare management strategies (those with and without guidelines) in terms of: referral patterns; eligibility criteria/guideline content; development, dissemination, and evaluation processes; and basic utilization data.

The survey entailed a written questionnaire followed by a telephone interview and subsequent verification phase. A 96% response rate was achieved.

Major findings were:

- 100% of respondents use patient history and previous diagnostic result information in their decision for eligibility and 91% personally review all cases and consult with the referring physician.
- 87% receive referrals only from specialists and subspecialists.
- 39% use written guidelines in their decision for eligibility. 100% use them in western Canada vs. 7% in eastern Canada.
- 100% use a prioritization system for eligibility. However, there is significant variation among systems (eg. premise is diagnostic efficacy vs. therapeutic benefit).
- There is no standard practice in the development, dissemination, or evaluation of MRI guidelines or implicit eligibility criteria in Canada.
- MRI service utilization patterns (patient origin, anatomical region, average waiting times) were similar across Canada regardless of the management strategy. Average waiting times for elective procedures tended to be shorter in those facilities using written guidelines.

Conclusions:

- There is no consistent or standard practice or premise used today to manage access to MRI technology in Canada.
- Further study is required to evaluate the real impact of clinical guidelines on MRI utilization and, more importantly, on disease specific therapeutic outcomes.
- It is recommended that appropriate groups such as the Canadian Radiologists Association and the Canadian Medical Association strive towards a consensus on the appropriate purpose and application of MRI technology, based on current published scientific evidence, that includes representatives from both the "providers" and "users" of the technology.

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1.0 BACKGROUND

The proliferation of expensive health technology in North America continues in spite of little understanding of its actual contribution to improving health outcomes or cost-effectiveness. Diagnostic imaging technologies are no exception. Costs of these particular technologies are frequently compounded by the dilemma of diagnostic redundancy among the different imaging modalities used in the diagnostic pathway of a clinical investigation.

In contrast to the United States, the rate of diffusion of Magnetic Resonance Imaging (MRI) scanners has been slower in Canada. The ratio of MRI scanners to population ranges from 1/650,000 to 1/1,000,000 across Canadian provinces, while in the United States this ratio is approximately 1/90,000 (Marshall, 1993). In the United States supply regulation strategies, such as Certificate of Need requirements, have not posed any real influence on MRI diffusion in that country. Rather, unregulated market forces of demand and supply have been the major drivers. In Canadian jurisdictions, the government is the central payer and this has resulted in more control of new technology acquisition.

For the purpose of health services planning there is no empirical evidence in the literature identifying the "appropriate" number of MRI units in Canada on the basis of population based estimates of need indicators such as disease incidence or prevalence. This suggests that health services planners have had to base acquisition decisions on other indicators more related to demand, such as queue length and average waiting time. The difficulty is that it must be assumed that all members in the queue are clinically eligible and that the procedure is the most appropriate.

Today, written clinical guidelines are becoming more commonplace in clinical practice. They are increasingly being advocated as a solution for a variety of concerns, including:

- improved quality of care through assisting decision making and educating providers and consumers on the appropriateness of procedures;
- standardizing clinical practice;
- enhancing access to care by preventing unnecessary care;
- a means by which the health care sector can optimally allocate resources;
- reducing the risk of legal liability (Battista, 1993).

A working definition of clinical guidelines is: "Standardized specifications for care developed by a systematic process that incorporates the best scientific evidence of effectiveness with expert opinion" (Leape, 1990). As the term guidelines indicates, they are recommendations. They focus on quality and appropriateness of care rather than cost, with the ultimate goal to improve patient care. Clinical guideline experts advocate that the quality of the processes for development, dissemination, and evaluation of guidelines is even more important than the resulting guidelines to ensure their usefulness and validity by all concerned clinicians and patients (Audet, 1993; Hayward, 1993; Leape).

In the case of MRI, consensus statements regarding clinical indications, contraindications, risks, advantages and limitations, have been developed in a number of countries, including: United States (1987), Australia (1991), Sweden (1992), and Switzerland (1989). The World Health Organization (1990) has compiled the collective views of an international group of experts on clinical practice guidelines for diagnostic imaging. They focus on the safety and diagnostic efficacy features of the technology.

A research group recently completed a two year observational study of the combined effect of written guidelines and case review on the utilization of MRI services in Manitoba (Mustard et al, 1992). At the conclusion of this retrospective review, projections suggested the combined effect of written guidelines and case review can result in 15 - 25% moderation in the demand for MRI service without compromising the health status of the population. This finding led to the interest to investigate the use of clinical guidelines in the management of MRI services across Canada.

2.0 PURPOSE AND OBJECTIVES

The purpose of this study was to determine the extent to which utilization of MRI services in Canada is managed by written clinical guidelines. The study focussed on a comparative analysis of management strategies. It did not attempt to determine the impact of guidelines on actual patient outcomes, nor did it examine the impact of guidelines or other management strategies on potential cost savings resulting from MRI replacing, or being replaced, by alternate diagnostic modalities. Objectives of the study were:

- a. to identify how the utilization of MRI services is managed across Canada;
- b. to compare those facilities using written guidelines with those that do not in terms of:

- Referral Processes
- Eligibility Criteria/Guideline Development, Dissemination, and Evaluation Processes
- Utilization Patterns

c. to compare content and process features of written guidelines; and

d. to identify benefits and limitations of written guidelines as expressed by MRI radiologists.

3.0 METHODOLOGY

A written questionnaire was developed for the purpose of this study. The questionnaire was translated into French for administration in Quebec. The questionnaire was mailed to the directors of MRI services in all publicly funded MRI facilities in Canada that were operational as of April 1, 1993. At that time, there were 23 such facilities, two of which were each operating two units. Pre-arranged 30 minute telephone interviews were conducted with each of the directors who agreed to participate. Two individuals conducted the interview. One asked and clarified questions while the other transcribed the responses. This was done to ensure consistency and facilitate timeliness of the process. Responses were transcribed and transposed using a spreadsheet format. These were then returned to the respondents for verification prior to the actual analysis. Confidentiality of the information was assured during all stages of the study. The study proposal and questionnaire were also disseminated to all provincial health ministries.

The analysis was in two parts: first, a comparative study of the responses to the questionnaire and second, a comparative review of the written guidelines that were submitted by the respondents.

4.0 SUMMARY OF FINDINGS

A brief description of the MRI facilities surveyed in this study is summarized in Table 1. Twenty-two (22) of the 25 MRI units were housed in general acute care hospital facilities. One of these units, at the Shaughnessy site of the University Hospital in British Columbia was designated to also serve the BC Children's Hospital site for 40% of its clinical operating time. The remaining three units were located in specialty facilities: the Hospital for Sick Children in Toronto (Pediatric), the Princess Margaret Hospital in Toronto (Oncology), and the Montreal Neurological Hospital (Neurology).

Of the 24 individuals who were surveyed, (including 2 directors at the Shaughnessy site), 23 participated in the study for a 96% response rate.

TABLE 1

Distribution of Publicly Funded MRI Units as of April 1993

Institution	Type	# MRI Units (year of installation)	Estimated Population 1991 (in 000s)
BRITISH COLUMBIA: ● St. Paul's Hospital (Vancouver) ● Vancouver General Hospital (Vancouver) ● University BC Hospital, Shaughnessy Site (services both BC Children's and Shaughnessy site) (Vancouver) ● University Site ● Greater Victoria Hospital Society - Royal Jubilee Hospital (Victoria)	● General Acute Care ● General Acute Care ● Acute for Pediatrics (40%) General Acute (60%) ● General Acute Care ● General Acute Care	1 (1992) 1 (1989) 1 (1992) 1 (1992) 1 (1989)	3,816
ALBERTA: ● Foothills Provincial Gen. Hospital (Calgary) ● University of Alberta Hospitals (Edmonton)	● General Acute Care ● General Acute Care	1 (1989) 1 (1992)	2,501
SASKATCHEWAN: ● Royal University Hospital (Saskatoon)	● General Acute Care	1 (1990)	995
MANITOBA: ● St. Boniface Gen. Hospital (Winnipeg)	● General Acute Care	1 (1990)	1,093
ONTARIO: ● Chedoke-McMaster Hospitals (Hamilton) ● St. Joseph's Health Centre (London) ● University Hospital (London) ● Sunnybrook Health Science Centre (North York) ● Ottawa General Hospital (Ottawa) ● Hospital for Sick Children (Toronto) ● Princess Margaret Hospital (Toronto) ● St. Michael's Hospital (Toronto) ● Toronto Hospital Toronto General Site Toronto Western Site	● General Acute Care ● General Acute Care ● General Acute Care ● General Acute Care ● General Acute Care ● Paediatric ● Oncology ● General Acute Care ● General Acute Care ● General Acute Care	1 (1992) 1 (1988) 2 (1986, 1992) 1 (1990) 1 (1987) 1 (1987) 1 (1987) 1 (1990) 1 (1986) 1 (1990)	9,840
QUEBEC: ● Hospital Saint-Luc (Montreal) ● Montreal General Hospital (Montreal) ● Montreal Neurological Hosp. (Montreal) ● Hospital Saint-Francois d'Assise (Quebec City)	● General Acute Care ● General Acute Care ● Neurology ● General Acute Care	1 (1987) 1 (1992) 1 (1984) 1 (1986)	6,812
NOVA SCOTIA: Victoria General Hospital (Halifax)	● General Acute Care	1 (1988)	898

During the survey, terminology relating to "guidelines", "protocols", and "indications" was inconsistently used. In one case, the facility referred to their written guidelines as being "protocol" in so far as they were explicitly followed in conjunction with case review in the determination to provide MRI services. While in most facilities, the term "protocol" referred to the technical procedure followed for a specific MRI study. Clarification to ensure a common use of nomenclature was provided during the telephone interviews.

The study findings are discussed and depicted in Figure 1.

4.1 MRI Service Management Strategies

All 23 respondents (100%) reported using completed requisition forms that indicate the clinical history of the patient and previous diagnostic imaging results. In addition, seven facilities (30%) use Patient Screening Information Forms for completion by the patient. Here patients are provided with checklists of conditions and implanted devices where MRI is contraindicated to ensure safety, and inform the patient of the procedure.

In twenty-one facilities (91%), the MRI radiologists personally reviewed all MRI requests for appropriateness and consulted with the referring physician.

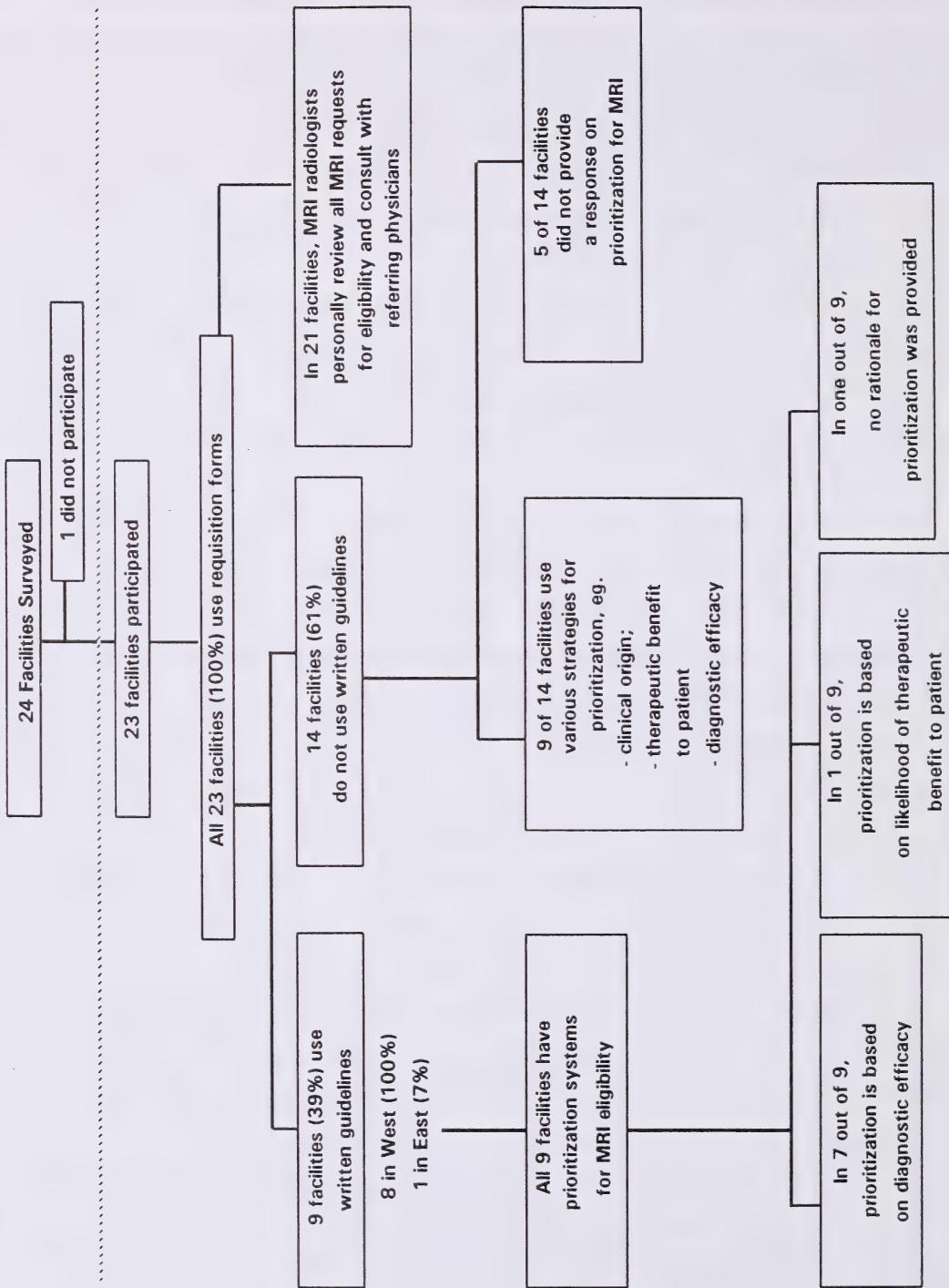
Nine of the twenty-three facilities (39%) used some form of written guidelines in their decision making. Among these, there was a marked geographic difference. All eight facilities (100%) surveyed in Western Canada (Manitoba, Saskatchewan, Alberta, and British Columbia) used written guidelines in contrast to only one (7%) in Eastern Canada (Quebec, Ontario, and Nova Scotia).

Respondents from the remaining fourteen facilities (61%) who do not use written guidelines rely implicitly on the most recent information on MRI indications reported in the literature along with patient information in the requisition and physician consultation in their decision making.

A variety of strategies for prioritization of MRI requests were indicated by those respondents who do not use written guidelines. Five (36%) of the 14 respondents chose not to respond to the question. The other nine respondents indicated one of the following premises for prioritization:

- by clinical origin (eg. neurological conditions receive the highest priority);
- patients who would receive the greatest immediate benefit (eg. acute treatable disease is a greater priority than those patients with chronic or incurable illnesses); and
- those conditions for which MRI is currently recognized as the best diagnostic imaging modality.

Figure 1 - Survey Response Overview



All nine facilities using written guidelines incorporate some system of prioritization for MRI service eligibility. In seven cases, the system was based on the diagnostic efficacy of the MRI technology. In one case, prioritization was based on anticipated therapeutic benefit to the patient. In the ninth case, no rationale for prioritization was provided. Furthermore, in this particular case, MRI services are only provided on a semi-urgent and elective basis. Emergency MRIs are not performed.

4.2 A Comparison of Management Strategies

a) Referral Patterns:

Only three respondents (13%), all of whom do not use written guidelines, reported that their facilities accept MRI requests from all physicians. In twenty facilities (87%) referrals are accepted only from specialists, and those indicated most frequently were neurologists (100%), neurosurgeons (96%), orthopedic specialists (70%), cardiologists (70%), thoracic and cardiac surgeons (57%), urologists (57%), and oncologists (57%).

Nine of the nineteen general acute care facilities accept direct referrals from the Worker's Compensation Board (WCB) or equivalent organization in their province. In three of these facilities, WCB referrals are examined through a special contract provision outside of regular clinical operating hours. The remaining general acute care facilities accept requests only from designated specialists such as physiatrists and orthopedic specialists. In Quebec, Commission Santé Sécurité Travail referrals were treated as a high priority relative to other provinces. The reason given was the potentially high financial and social costs of claimants due to time away from work, and the corporate priority of the Ministry of Health and Social Services in that province to return individuals to the workforce as quickly as possible.

b) Eligibility Criteria/Guideline Development, Dissemination, and Evaluation:

Seven out of the nine facilities using written guidelines reported that they were developed by the facility's MR radiologists and representatives from the referral physician specialist groups. Two facilities indicated that they were exclusively developed by MR radiologists and representatives from other radiologist or scientist groups. Facilities in two provinces also consulted with their provincial medical and radiologist associations and health ministries (See Table 2A).

Table 2A - Written MRI Guideline Comparison — PROCESS

Facility	Who developed guidelines?	Source of guidelines (scientific evidence)	Guidelines indicate development process (e.g. methods used)	Guidelines are disseminated to:	Guidelines are reviewed:	Guidelines indicate last date of revision	Degree of flexibility or caveats indicated in guidelines
A	MR radiologists, referring specialist group representatives in consultation with Medical Association, Provincial Association of Radiologists and Ministry of Health.	Literature adopted from NIH consensus statement (US).	No	MR radiologists referring physicians	Every 2-3 years	No	No
B	Same as A	Same as A	No	All medical staff	Every 2-3 years	No	No
C	Same as A	Same as A	No	MR radiologists only	Formally every 2-3 years. Informally, more frequently	No	No
D	MR radiologists and referring specialist group representatives.	Original	No	MR radiologists; referring physicians; hospital chiefs of specialties	Every 2-3 years	Yes	No
E	Same as D	Adopted from those of another Canadian facility	No	Same as A	As required. Normally, every 2-3 years.	Yes	Yes. Stated as guidelines, are not absolute. All reasonable requests will be considered.
F	MR radiologists and external radiologist colleagues. Consulted with referring specialists.	Original	No	MR radiologists; referring physicians; hospital administration	4-6 months or in response to clinical demand	No	No
G	MR radiologists, College of Physicians and Surgeons, Provincial Association of Radiologists, Ministry of Health.	Adopted from another Canadian facility.	No	MR radiologists; all radiologists; referring physicians; hospital administration.	Depends on operating hours and waiting list	Yes	Yes. Stated as guidelines not absolutes. All reasonable requests will be considered.
H	MR radiologists in consultation with neuroradiologists and body radiologists.	Adopted from another Canadian facility.	No	Same as A	Every 2-3 years. In practice, it depends on waiting list.	Yes	No
I	MR radiologists and scientists.	Original	No	MR radiologists only	6 months	No	No

Table 2B: Written MRI Guideline Comparison — CONTENT

Facility	Stated goals and objectives	Indication Classification	System of Prioritization	CONTENT	
				Perequisite testing documented	Identification of specialists or sub-specialists eligible to refer
A	Not documented	<ul style="list-style-type: none"> ●Neuroradiology ●Musculoskeletal ●Thoracic ●Pulmonary ●Cardiac ●Abdominal ●Genitourinary ●Gastrointestinal ●Gynaecological ●Paediatric 	<ul style="list-style-type: none"> ●High indication because of unique information. ●Moderate indication to avoid invasive study. ●No indication due to another test recognized as being superior. 	<p>Yes.</p> <ul style="list-style-type: none"> ●Neuroradiology: all must have CT. Exceptions where MR is initial exam: Multiple Sclerosis, demyelinating and dysmyelinating disease, craniocervbral junction; ●Spinal cord: all must have CT. Exceptions where MR is initial exam: myelopathy; myelitis congenital disorder; chronic spinal cord compression. ●Musculoskeletal: all must have plain film and CT. ●Thoracic, pulmonary: CT. ●Cardiovascular: initial echo and doppler. ●Abdominal: uroradiology: ultrasound and CT. ●Gastrointestinal: ultrasound and CT. ●Gynaecological: ultrasound or CT. 	Yes
B	Not documented	Same as A	Same as A	Same as A	Yes
C	Not documented	Same as A	Same as A	Same as A	Yes
D	Not documented	<ul style="list-style-type: none"> ●CNS ●Spine and spinal cord ●Thoracic ●Abdominal ●Pelvic ●Musculoskeletal ●Paediatric 	<ul style="list-style-type: none"> Same as A 	<p>Partially</p> <ul style="list-style-type: none"> ●CNS: all must have initial CT. Exceptions where MR is initial exam: suspect demyelinating disease (MS); pituitary lesions - microadenomas; infratentorial neoplasms; craniocervbral junction ●Spinal cord: MRI is initial exam: myopathies; congenital; spinal cord compression. ●Abdominal - CT and/or ultrasound first. 	No

Table 2B - Written MRI Guideline Comparison — CONTENT

	Stated goals and objectives	Indication Classification	System of Prioritization	Prerequisite testing documented	Identification of specialists or sub-specialists eligible to refer
E	To ensure appropriate access to a limited resource	Same as A	Same as A. However, high priority clinical indications are not distinguished as in A.	Same as A except CT is initial exam in crano-vertebral junction.	Yes
F	To maximize effective utilization of MRI	Priority 1 Priority 2 Priority 3 Priority 4	<ul style="list-style-type: none"> ● Priority 1 = Urgency in making diagnosis with MRI prior to instituting therapy. Preoperative and acutely ill patients. ● Priority 2 = MR results can alter patient management and provide additional information for surgeon or where MR = best means for follow up. ● Priority 3 = yield of positive results is low, non-urgent follow-up, chronic problem or limited therapeutic options. ● Priority 4 = Little or no treatment available once diagnosis is established. 	No	No
G	To ensure appropriate access to a limited resource	Same as A	<ul style="list-style-type: none"> ● Highest priority = indications for which MR is the only test likely to confirm the diagnosis. ● High priority = pre-operative or seriously ill patients. 	Same as E	Yes

Table 2B - Written MRI Guideline Comparison — CONTENT

Facility	Stated goals and objectives	Indication Classification	System of Prioritization	Prerequisite testing documented	Identification of specialists or sub-specialists eligible to refer
H	Not documented	<ul style="list-style-type: none"> • Neuroradiology • Spine • Head and neck • Thorax • Musculoskeletal system • Upper Abdomen and Adrenals • Kidneys and Retroperitoneum • Pelvis 	<ul style="list-style-type: none"> • Absolute - MRI is the modality of choice because the information available exceeds that of any other diagnostic modality, and cannot be duplicated by any other means. • Strongly preferred - MRI either better defines the nature of a disease process or MRI is diagnostically equivalent to alternate tests but the alternate tests carry a risk (e.g. contrast enhanced CT). • Moderate - equal to, complementary to, or may possibly add information to that available with other modalities. • Not indicated - MRI is unlikely to be helpful. 	Partial. Neuroradiology: All must have CT. Exceptions where MR is initial exam: for demyelination and assessment of myelination. Spine: intramedullary lesions, myelopathy, crano cerebral junction lesions. <ul style="list-style-type: none"> • Thorax (Pulmonary): All CT first. • Musculoskeletal: not identified. • Upper abdomen and adrenals: CT first. • Kidneys and retroperitoneum: not identified. • Pelvis: ultrasound and/or CT first. 	Yes
I	To ensure appropriate access to a limited resource. (Only use to delineate conditions not shown well by other modalities and when it directly affects patient care).	<ul style="list-style-type: none"> • Neurological • Musculoskeletal • Chest • Abdomen • Pelvis 	<ul style="list-style-type: none"> • High priority • Low priority • Very low priority (no definitions documented). (May vary from hospital to hospital, depending on the patient population). 	Yes. Neurological: <ul style="list-style-type: none"> • Inflammatory lesions: suspected cerebellar and brain stem lesions - if urgent, do CT first - MRI first if semi urgent or elective. • Acoustic neurons: MRI only on elective basis. • Sclerosis - MRI only on elective basis. Congenital abnormalities of spine - elective or semi urgent MRI. Spinal cord lesions: MRI first if urgent or semi urgent, otherwise CT first. <ul style="list-style-type: none"> • Musculoskeletal: staging or malignant bone and soft tissue tumours - MRI first. • Chest: Echocardiography, chest X-ray or CT first. • Abdomen - CT and/or ultrasound first. • Pelvis: ultrasound, CT first. 	No

Guideline dissemination patterns also varied among respondents. Seven of the nine facilities indicated that guidelines were disseminated to MR radiologists and referring physician specialists. Three of these reported that they were also sent to hospital staff, administration, chiefs of all specialist groups or all hospital medical staff. The two remaining facilities reported that the guidelines were disseminated exclusively to MR radiologists (See Table 2A).

Those who do not use written guidelines communicate indications for MRI through verbal consultation with the referring physicians and through educational sessions such as hospital rounds and in-services.

The review and updating of written clinical practice guidelines or unwritten implicit eligibility criteria varied from: once every two or three years (26%); annually (26%); as required (17%); and every six months or less (17%). All (100%) reported involving the MRI radiologists in the review while 14 respondents (60%) indicated that representatives of referral specialist groups were also involved. Only three respondents, who do use written guidelines, reported also involving representatives from other groups including hospital administration, the provincial health ministry and other client hospitals.

c) Utilization Patterns:

A limitation of the study was the variation in the degree of accuracy of utilization data submitted by the facilities. In some cases, a higher degree of accuracy was available as the information was already being collected, while in others, a "best estimate" of utilization experience was provided. Furthermore, only data representing the most recent year of full operation was collected. This may or may not represent a typical experience in all cases. Therefore, any attempt to conclude what real impact written clinical guidelines or other strategies have on utilization management would be open to question and valid criticism.

i) Patient Study Distribution:

The distribution of MRI studies performed on hospital inpatients, outpatients, local residents, and out-of-province referrals was relatively consistent across the country. The majority of studies were performed on outpatients (range from 67% to 95%, with over half of the respondents reporting 80%). Out-of-province referrals were accepted by all but one general acute care facility. Four facilities reported that 19 to 22% of their caseload originated from out-of-province. In two cases, these were the only facilities in the province while in one case the facility was a specialty hospital. The remaining

facilities reported that out-of-province referrals was an uncommon occurrence (less than 2%).

ii) Anatomical Study Distribution:

The ranges in distribution of MRI studies by anatomical region in Table 4 show some variation that cannot be explained by the use of written guidelines or by geographic location.

Generally, the proportion of studies by anatomical region were performed in descending order: on the head, the spine, bones and joints. Respondents reported that the distribution by anatomical region was also consistent with those individuals waiting for an examination. In other words, the greatest proportion of requests waiting examination involved the head. It was also indicated that the types and number of studies were also influenced by the capability of the equipment. The absence of the software necessary for examination of the cardiothoracic area would result in the use of some other diagnostic modality.

Table 3
Anatomical Study Distribution [Range in % (50th percentile)]

Anatomical Region	Facilities using Written Guidelines ⁽¹⁾ n = 10	Facilities NOT using Written Guidelines n = 14	All Respondents n = 24
Head	31-60.0% (48.4)	32-82% ⁽²⁾ (53)	31-82% ⁽²⁾ (50)
Spine	14.5-54% (27.5)	10-46.88% (23)	10-54% (25)
Bone & Joint	2.1-25% (13.3)	0-25% (12.3)	0-25% (12.56)
Cardiothoracic	0.4-8% (1)	0-7% (1)	0-8% (1)
Abdominal	0-3% (0.6)	0-8% (2)	0-8% (1.17)
Pelvis	0-15% (0.6)	0-8% (2)	0-15% (1.21)
Other	0-3.2% (0.15)	0-23.6% ⁽²⁾ (0)	0-23.6% ⁽²⁾ (0)

(1) Two different target populations were served by one MRI facility and therefore two responses were provided.

(2) These upper extremes were reported by specialty hospitals. Excluding these values does not significantly change the 50th percentile value.

iii) Average Waiting Times:

The most significant finding regarding the responses to the question on average waiting times is the wide variety of classification systems used throughout the country. The different systems reported included:

- Emergency/Urgent/Semi-Urgent/Elective
- Priority 1 - 4 where:
 - Priority 1: emergent cases
 - Priority 2: urgent cases where MRI results could potentially alter patient management.
 - Priority 3: elective cases where MRI is indicated but the likely yield of positive results is low or for non-urgent follow-up cases or chronic problems or where limited therapeutic options exist.
 - Priority 4: little or no treatment is available once diagnosis is established.
- Inpatient versus outpatient waiting times.
- Waiting times based on exams requiring neuro-sedation; neuro non-sedation and other body exams.

In a comparison of those facilities using written guidelines with those that do not, the average times for emergent/priority 1 categories and urgent/semit-urgent/priority 2 categories were similar in both groups. Average waiting times reported for emergent/priority 1 cases was 24 hours and less than one week for urgent/semit-urgent/priority 2 cases. One facility using written guidelines reported that MRI studies were not performed on an emergent or urgent basis.

The greatest variation occurred in the elective/priority 3 and 4 categories. Facilities using written guidelines reported a range of 3 weeks to 4 months with more than 50% reporting 6 weeks compared to those not using written guidelines who reported a range of two weeks to 1 year with more than 50% reporting 3 months.

It is difficult to offer any meaningful interpretation on this variation in elective procedure waiting times without more details on the nature of requests waiting examination and given the inconsistencies in the classification system.

iv) Hours of Operation for Clinical Use:

Weekly clinical operating hours, after allowing for preventative maintenance downtime, ranged from 20 to 112 hours, with more than 50% reporting 45 hours per week, in facilities using written guidelines and from 40 to 112 hours, with more than 50% reporting 75 hours per week, in those facilities not using guidelines. The average time cited per exam ranged from 30 minutes for a brain scan to 90 minutes for a cardiology study. The majority of examinations were completed within 45 - 50 minutes.

4.3 Comparison of Written Guidelines

Tables 2A and 2B provide a descriptive comparison of the written guidelines submitted by the respondents. Content and process features, as identified by some of the experts in the field of clinical practice guidelines (Audet, 1993; Hayward, 1993; and Leape, 1990), were analyzed.

4.4 Perceived Benefits and Limitations of Written Guidelines

Those surveyed who do not use written guidelines were of the opinion that guidelines at this stage of the technology are premature. Radiologists and practitioners are still on a learning curve in terms of understanding the true potential of this technology in clinical practice. Consequently, written guidelines at this stage of the technology are viewed by many of those surveyed as too restrictive, limiting and inflexible. One respondent indicated a concern that referring physicians would have greater incentive to manipulate access if they had guideline information.

In one facility, operation of the MRI unit was said to be largely controlled by administrative policy and the budget. Here there is an expectation to contribute financially to the hospital operating budget through the provision of MRI services for certain fee for service referrals. This practice could be compromised by the enforcement of clinical guidelines.

Facilities that do use written clinical practice guidelines assert that guidelines help ensure appropriate access to the technology and facilitate "acceptable" waiting periods. They also viewed written guidelines as a valuable tool in educating referring clinicians on the appropriate use of the technology. Flexibility was ensured through individual case review.

5.0 DISCUSSION

Results of this survey show significant similarities and differences in the management and utilization of MRI services across Canada. Similarities include:

1. a strong emphasis on individual case review and patient history in the determination for eligibility;
2. consistent utilization patterns both in terms of patient origin (eg. hospital inpatients, outpatients, local residents and out-of-province referrals) and the relative proportions of studies by anatomical region (head, spine, joint, cardiothoracic, abdomen, pelvis, other); and
3. the restriction of referrals to specialists and sub-specialists.

One of the most significant differences among MRI facilities was the use of written guidelines by all facilities surveyed in the western provinces in contrast to facilities in eastern Canada where only one facility uses them. Participants in western Canada remarked that MRI units in their provinces were regarded as provincial resources as opposed to belonging to a particular facility or catchment area. This led to the need to develop a set of guidelines that would ensure equal access by all individuals regardless of their residence.

There was consensus among those who did not use written guidelines that guidelines were too restrictive, inflexible and, in fact, could potentially result in inappropriate clinical decisions and practices. The potential of the technology was still very much in the discovery stage and guidelines could compromise its potential effectiveness. On the other hand there was no consistency among these same facilities in terms of the system used to prioritize patients appropriate for a MRI exam. Priorities ranged from financial incentives, to those patients who would potentially receive the greatest benefit from treatment. Although MRI radiologists in these facilities stated having very positive working relationships with referring physicians, they are also the experts and final decision makers when it comes to accessing the technology.

There was little consistency or standardization found in the written guidelines that were used by MRI facilities. In half of the cases, no statements of intended purpose or goals were identified. None of the guidelines included a documented process for guideline development or dissemination. Referring physicians were invited to provide input for future revision in only two cases.

In three cases, the MRI radiologists were the sole developers and users of the written guidelines. One can postulate that the rationale here was that because these guidelines were based on diagnostic and technical efficacy, the MRI radiologists would serve as the best experts in their development and use. In contrast, experts on clinical practice guidelines assert that if appropriateness guidelines or criteria are to be considered valid and useful by all concerned, physician groups who develop guidelines should include representation from both the "providers" of the procedure and referring physicians and others who "use" the information. This becomes particularly important when the decision to apply a diagnostic test is based on other types of evaluation such as comparative efficacy (the relative improvement in diagnostic information provided by

a modality relative to another modality), therapeutic impact (the contribution of diagnostic information to disease management), or health status outcome (the net contribution to morbidity and mortality outcomes as a result of the combined impact of diagnosis and treatment) (Mustard et al., 1992). Unfortunately, while there is an abundance of literature on the technical efficacy and diagnostic accuracy of MRI, objective and comprehensive publications addressing therapeutic impact and health status outcomes are extremely limited.

In eight out of the nine facilities using clinical guidelines, instructions for prerequisite testing using alternate modalities such as CT were identified in the guidelines. However, there were some differences wherein an initial CT exam was required for certain conditions of the central nervous system while others indicated MRI as the initial exam. It might be inferred from this that there were significant differences in the demands on these alternate modalities.

Perhaps the most important point of difference among the written guidelines, as was observed among those facilities which do not use guidelines, was the premise for prioritization. Most facilities prioritize eligibility on the basis of diagnostic efficacy of the MRI technology, while in one case, priority to access was related to the likelihood of benefitting the patient through treatment. Hence, in the former system, diagnosis of a non-treatable condition such as multiple sclerosis would receive a much higher priority rating than in the latter priority system where it would receive a very low rating.

An important omission in the guidelines in all cases was the absence of explicit reference to any scientific evidence used in the derivation of the guidelines.

It is difficult to offer meaningful comment on what impact the implementation of written guidelines has had on MRI utilization from the information collected in this study. One would need to conduct a study that examined utilization patterns before and after the implementation of written guidelines. One observation that would require further study has to do with average waiting times for elective procedures. In spite of relatively equal or fewer operating hours relative to population size, average waiting times for elective procedures are generally shorter in those facilities using written guidelines. One possible explanation is that written guidelines may serve as a more explicit filter and consequently fewer clinical conditions warrant an elective MRI. Another explanation may be that referring specialists are being more consistently educated about the merits and limitations of MRI through the written guidelines. This is likely to influence their

referring practices.

6.0 CONCLUSIONS

There is no consistent or standard practice used today in Canada to manage access to MRI technology. There is a difference in opinion on the perceived benefits and limitations of written clinical guidelines held by those who use them from those that do not, as they relate to MRI technology. In spite of the growing literature on clinical practice guidelines, many MRI radiologists in Canada are sceptical of their merits and usefulness, specifically when applied to an evolving diagnostic technology such as Magnetic Resonance Imaging. The majority of MRI radiologists in Canada predicate their decisions on findings from individual case review, physician consultation, and the patient's history.

The content and process characteristics of effective written guidelines, as advocated by Audet, Hayward and Leape were inconsistently or only partially applied in all cases.

It cannot be concluded from this study that the use of written guidelines results in significantly different MRI service utilization patterns in Canada. This would require a study of utilization patterns prior to and following the implementation of written guidelines. A separate study that examines and compares average waiting times and the composition of the waiting queues in facilities that use guidelines from those that do not may yield useful utilization information. It would also be interesting to compare the utilization patterns of those facilities that prioritize access based on diagnostic efficacy versus those based on therapeutic impact to determine what impact these different premises have on the need and demand for MRI.

Study findings indicated that different prioritization systems for MRI examination exist in Canada among facilities that use written guidelines and among those that do not. Most are based on diagnostic efficacy while others are based on likely therapeutic benefit to the patient. Perhaps the single most important determinant in managing the use of MRI is its intended purpose (eg. diagnostic efficacy vs. therapeutic impact). This ultimately will shape the content of the guidelines or eligibility criteria and the processes including the groups represented in their development, dissemination, and evaluation.

While a number of findings in this data suggest further study, it is recommended that the Canadian Association of Radiologists and the Canadian Medical Association

strive for solidarity among their members on the intended purpose and application of MRI technology across the country based on current published scientific evidence. There needs to be discussion of what type of prioritization system is most appropriate along with its limitations and implications. There needs to be agreement on what information is appropriate for the radiologists, the referring physicians, and the patients regarding the usefulness and limitations of this technology relative to other imaging and diagnostic technologies. This could also serve as an excellent starting point to initiate discussion on MRI research relating to actual therapeutic outcomes based on an ongoing standardized collection of MRI scan data.

Finally, as with any technology, there should be some communication strategy at either the national or provincial level to educate all health care providers and consumers on the efficacy, safety, and limitations of MRI. This is important to promote more appropriate utilization of the technology.

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